

The Newcastle Gateshead Enhanced Health in Care Homes Vanguard: An Economic Analysis

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BACKGROUND

In January 2015, the NHS invited individual organisations and partnerships to apply to become 'vanguards' for the new care models programme, one of the first steps towards delivering the *NHS Five Year Forward View* (published October 2014) and supporting improvement and integration of services. Between January and September 2015, a number of vanguards were selected to take a lead on the development of new care models which would act as the blueprints for the NHS moving forward and the inspiration to the rest of the health and care system. Through the new care models programme, complete redesign of whole health and care systems were being considered. Support in the form of extra funding was allocated to each vanguard annually from 2015 until 2018 in order to complete the redesign of services.

The Newcastle Gateshead Enhanced Health in Care Homes vanguard was launched in March 2015. The vanguard's purpose was to increase collaborative working and establish partnerships between health and care providers to improve the health and wellbeing of residents and thereby reduce pressure on primary, secondary and social care services. In Newcastle, there was a limited and piecemeal rollout of the vanguard. As such, this evaluation focuses only on the effect of the vanguard in care homes in Gateshead

As the vanguard was implemented only in Nursing and Residential care homes, this analysis only considers the Nursing and Residential Care home populations of Gateshead. Currently in Gateshead there are 34 care homes with 1694 care home beds in total. However, this evaluation only utilises data from 30 care homes consisting of 1503 beds as homes with populations including learning disabilities and younger residents were excluded.

The vanguard consists of three key features: Link GP Practices, Older Person Specialist Nurses (OPSN), and Multi-Disciplinary Teams (MDTs). Link GP Practices strand of the vanguard consists of signing up residents of a care home to the same GP practice (usually the closest geographically). In Gateshead, all care homes were linked to a GP practice towards the end of 2012 before the vanguard began in March 2015. The linked GPs attended each care home once a week. There were six OPSNs in Gateshead working in nursing care-homes in order to support care home staff in delivering care. The MDTs convened once a week and consisted of key healthcare professionals such as; geriatric consultants, link GPs, OPSNs and psychiatric consultants.

METHODS

Data

Count data was obtained from the North of England Commissioning Support Unit (NECS) from April 2013 to December 2017 regarding the following outcomes:

- A&E admissions
- Non elective admissions (excluding ambulatory care)
- Outpatient Appointments (new and review)
- Bed days

This included data for 23 months prior to the introduction of the vanguard in March 2015, and 34 months post introduction. The data was obtained for the each of the outcomes for residents in all Gateshead care homes using a postcode proxy. This proxy consisted of the postcode of each care home with an additional filter of age exceeding 80 years. Furthermore, the data includes outcomes

for the whole care home population of Gateshead, and also for those care homes that are a mix of residential and nursing residents.

The data for the outcomes of interest are likely to be an overestimate of the true care home figures. This is due to data collection issues regarding the use of postcodes of the area around care homes to identify the care home population and the use of services.

Analysis

The impact of the introduction of the vanguard on key outcomes was assessed using a log linear time series Ordinary Least Squares (OLS) regression.

OLS regression model

$$\ln(Y_t) = \beta_1 + \beta_2 T_t + \beta_3 W + \beta_4 D + \beta_5 TX_t$$

Where $\ln(Y_t)$ is the proportional change in each of the outcomes

T_t is the underlying time trend before the introduction of the vanguard

β_2 is the percentage change in the relevant outcome for each month prior to the vanguard

W is a dummy variable for winter months and = 1 from November to February and =0 otherwise

β_3 is the percentage change in the relevant outcome as a consequence of the impact of winter

D is the dummy variable showing the impact on outcome for the period immediately following the vanguard

β_4 is the percentage change in the outcome in the period immediately after the introduction of the vanguard

TX_t is an interaction term showing the percentage point change of the outcome following the introduction of the vanguard

This is the base or overall model. However, the specification of the regression model for each outcome may vary slightly depending on the characteristics of the raw data. Two variants of this model were used depending on the outcome measure. One where a segmented regression was used, where on analysing the observed data for A&E attendances, a step change immediately following the introduction of the vanguard did not occur and so the dummy variable showing the impact of the vanguard in the time period immediately after its introduction was dropped. The second model (specifically for the impact on outpatient appointments) where the winter dummy variable was dropped due to a lack of seasonal effect.

Each model was evaluated in terms of the underpinning assumptions using a variety of tests to ensure we obtained best linear unbiased estimates (BLUE).

Costs

Care Model Running Cost

The cost of running the enhanced health in care homes model as a consequence of the vanguard was calculated using micro costing from an NHS perspective with each component cost shown in table 1. The calculation of the cost of the care model assumed that an MDT meeting took place for four hours for fifty-two weeks of the year. Furthermore, it was assumed that two care plans took

place annually per care-home bed. These assumptions therefore may overestimate the true costs of running the care home.

Table 1: Component costs of the Enhanced Care in Care Homes Model

Resource Use	Cost (£)	Total cost (£)	Source
GP link cost	4000 per care home	120,000	Newcastle-Gateshead CCG
Practice educator	36,250 per year	36,250	Mid-point grade 7 agenda for change pay scale (2016)
Dietician	30,375 per year	30,375	Mid-point grade 6 agenda for change pay scale (2016)
6 Older-Person Specialist Nurses	36,250 per nurse per year	217,500	Mid-point grade 7 agenda for change pay scale (2016)
Old-age Psychiatrist	138 per hour	28,704*	2016 PSSRU
2 Geriatric Consultants	135 per hour per consultant	56,160*	2016 PSSRU
1503 care home beds receiving care plans	£100 per care plan	300,600**	Newcastle-Gateshead CCG

* Assumed the MDT meeting is 4 hours long and takes place 52 weeks per year

** Assumed two care plans per care home bed every year

Overall, there was an annual cost of £758,590 of providing the model of care in Gateshead, producing an average monthly cost of £63,215. The total cost of the models of care between March 2015 and December 2017 was £2,149,338.

In the nursing and mixed care homes, all six OSPNs, GP links and the MDTs were implemented as part of the models of care. In Gateshead there are 17 nursing and mixed care homes consisting of 1038 care home beds. As such, the annual cost of providing the model of care in the mixed and residential homes in Gateshead was estimated to be £644,598, producing a monthly cost of £53,716. The total cost of the models of care between March 2015 and December 2017 in the nursing and mixed residential homes was estimated at £1,826,336. This calculated cost is a sub-cost of the total cost and not in addition to the cost calculated above.

Potential cost implications of the introduction of the new model of care within the vanguard

The cost implications for resource use for each of the outcomes was estimated by comparing the predicted outcomes without the impact of the vanguard (what would have happened without the vanguard), with the predicted outcomes as a consequence of the introduction of the vanguard. This analysis assumes that the pre-vanguard outcome trend would have remained the same during the post-vanguard period if the vanguard had not been introduced. Cost implications were estimated over a 34 month period (April 2015 until December 2017) following the introduction of the vanguard. The unit costs used for this analysis is set out in table 2 below.

Table 2 Unit cost for resource use

Resource Use	Unit Cost (£)	Source
A&E attendance	138	NHS reference costs 2015/16
Non-elective admission	3058	NHS reference costs 2015/16
Outpatient (consultant lead geriatric medicine)	227	NHS reference costs 2015/16
Bed Day	400	Data.gov.uk
Non-elective bed day (enhanced tariff option)	222	NHS reference costs 2015/16

RESULTS

All Care homes

Using data from thirty care homes in Gateshead the following results were obtained regarding the impact of the vanguard on: A&E attendances, non-elective admissions, new outpatient appointments, and bed days.

Result 1: A&E attendance

A&E attendance for All Care Homes:

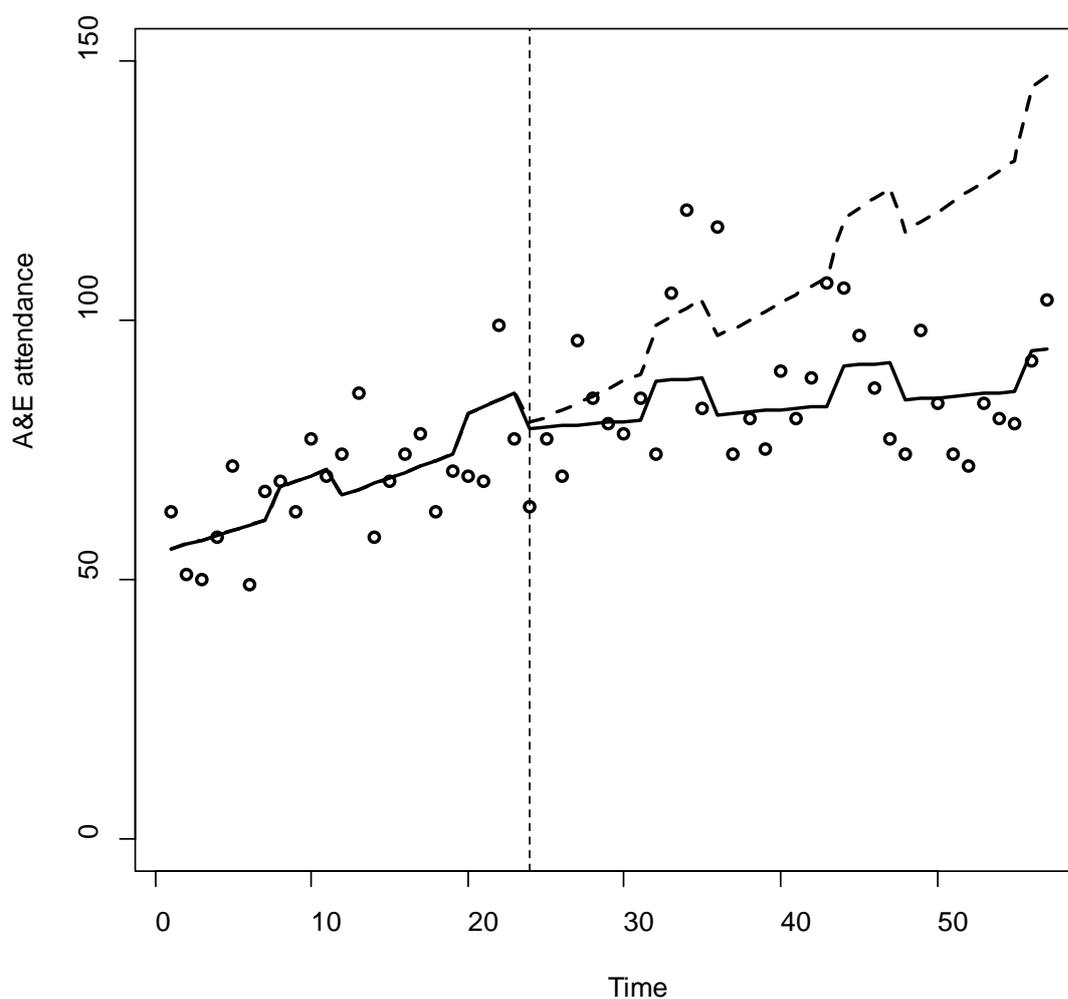


Figure 1

In figure 1, A&E attendances for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted counterfactual, this is the predicted A&E attendances that would have occurred if the vanguard was had not been introduced.

Prior to vanguard there was an estimated monthly increase in A&E admissions of 1.6%. In addition, there was an estimated increase of 8.5% during the winter period. Following the introduction of the vanguard the monthly increase was estimated at a lower rate of 0.3%. The vanguard has been estimated to have reduced the monthly increase in A&E admissions by 1.3 percentage points.

Had the vanguard not been introduced, A&E admissions would have cost a total of £507,122 in the 34 months following March 2015. However, due to the reduced rate of increase that has occurred following the start of the vanguard there has been a lower cost of £399,088. Therefore there has been a cost saving during the 34 months of the post-vanguard period of £108,035.

Result 2: Non-elective admissions (NEL)

Table 2 below shows the frequencies (both total and the monthly mean) and type of non-elective admissions classified by the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) (World Health Organisation 2015) both before and after the introduction of the vanguard. The four most common reasons for non-elective admissions both before and after are

- Respiratory complications,
- Injury, poisoning and certain other consequences of external causes
- Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified
- Diseases of the genitourinary system

Diseases of the respiratory system was the most commonly occurring reason for non-elective admissions in both time periods and includes conditions such as Pneumonia. The category 'Symptoms, signs and abnormal clinical and laboratory findings not classified elsewhere' also has a high frequency of events recorded. This event type includes all ill-defined conditions such as chest pain or nausea and vomiting suggesting this is an umbrella term for non-elective admissions in which no diagnosis is classifiable elsewhere. This could be due to the fact that illness in the most frail can often present as a functional change making the initial diagnosis and coding challenging. Injury, poisoning and certain other consequences of external causes is a category that includes diagnoses of mostly fractures and likely pertains to incidences of falls. Diseases of the genitourinary system consists mostly of diagnosis of urinary tract infection (UTI).

There are four categories (Certain Infectious and parasitic diseases; Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism; Diseases of the ear and mastoid process; Diseases of the respiratory system) that have a higher mean monthly occurring in the post-vanguard period compared to the pre-vanguard period. Of these events, Diseases of the ear and mastoid process; and Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism are rare occurring. Certain infectious and parasitic diseases and Diseases of the respiratory system are common occurring events both before and after the vanguard. Mean monthly non-elective admissions for certain infectious and parasitic diseases have increased by 1.04 post-vanguard and the mean monthly non-elective admissions for diseases of the respiratory system have increased by 0.46.

Table 3: The number of non-elective admissions before and after the introduction of the Vanguard according to ICD-10 Chapter

ICD-10 Code by Chapter	Number of Non-elective admissions before Vanguard	Mean Number of events each month	Number of non-elective admissions after Vanguard	Mean number of events each months
Certain infectious and parasitic diseases	87	3.78	164	4.82
Neoplasms	17	0.74	24	0.71
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	7	0.30	12	0.35
Endocrine, nutritional and metabolic diseases	54	2.34	78	2.29
Mental and behavioural disorders	35	1.52	31	0.91
Diseases of the nervous system	25	1.09	30	0.88
Diseases of the eye and adnexa	3	0.13	0	0
Diseases of the ear and mastoid process	0	0	1	0.03
Diseases of the circulatory system	126	5.48	146	4.29
Diseases of the respiratory system	364	15.83	554	16.29
Diseases of the digestive system	111	4.83	123	3.62
Diseases of the skin and subcutaneous tissue	44	1.91	45	1.32
Diseases of the musculoskeletal system and connective tissue	76	3.30	54	1.59
Diseases of the genitourinary system	184	8	218	6.41
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	262	11.39	301	8.85

Injury, poisoning and certain other consequences of external causes	282	12.26	275	8.09
Factors influencing health status and contact with health services	5	0.22	4	0.12

Non-elective Admissions for All Ca

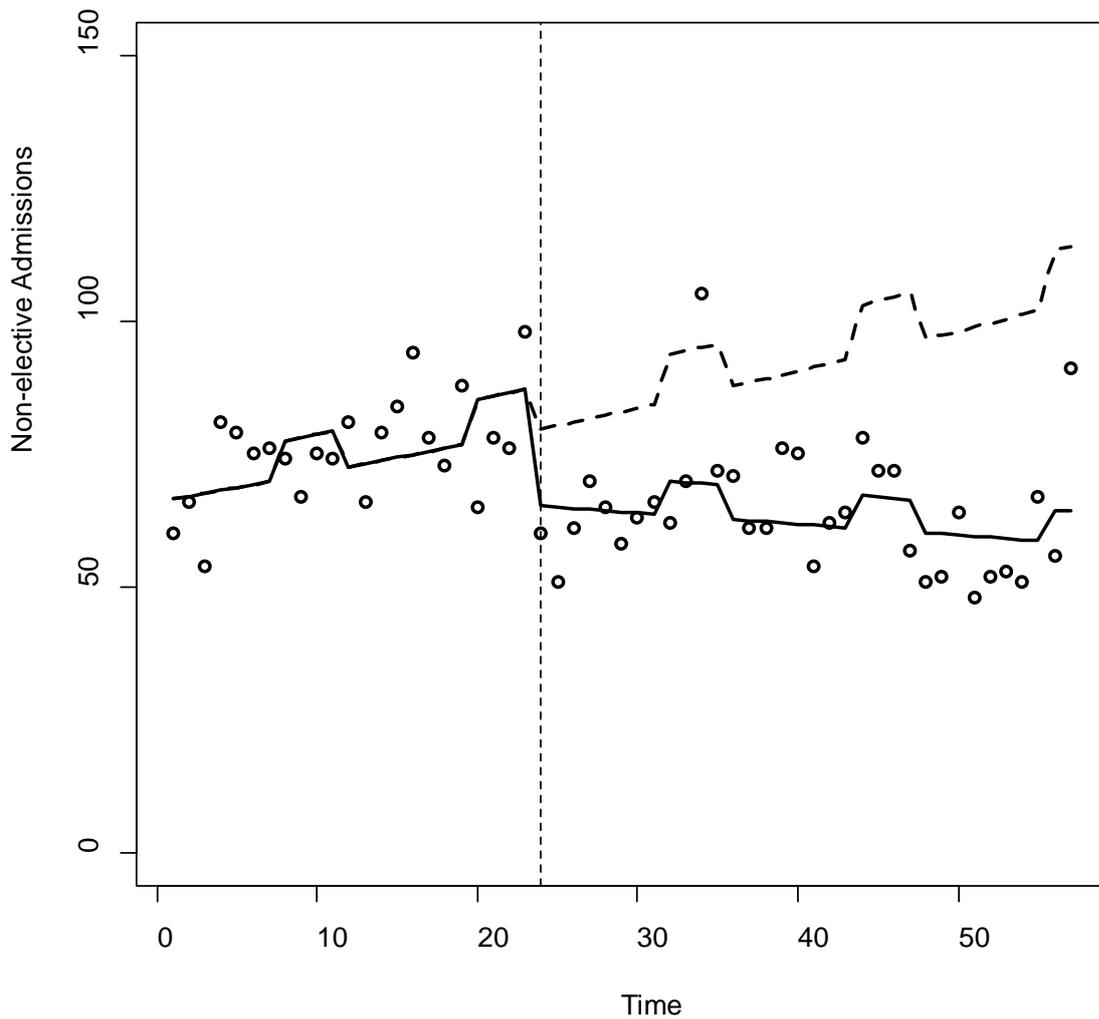


Figure 2

In figure 2, non-elective admissions for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted counterfactual, this is the predicted non-elective admissions that would have occurred if the vanguard had not been introduced.

From April 2013 there was an estimated monthly increase of 0.8% in Non-elective admissions. In addition to this, there was an estimated increase of 9.6% during the winter period. When the

vanguard was introduced in March 2015, there was an estimated initial step reduction in Non-elective admissions of 19%. This was followed by an estimated 1.1 percentage point reduction in the monthly increase, resulting in a post-vanguard monthly reduction in non-elective admissions of 0.3%.

Had the vanguard not been introduced, the cost of non-elective admissions would have been £9,770,646. However due to the introduction of the vanguard, the estimated cost over this time period was lower at £6,609,255. The introduction of the vanguard has resulted in an estimated cost saving due to lower non-elective admissions of £3,161,391 over 34 months.

Result 3: Outpatient Appointments (new)

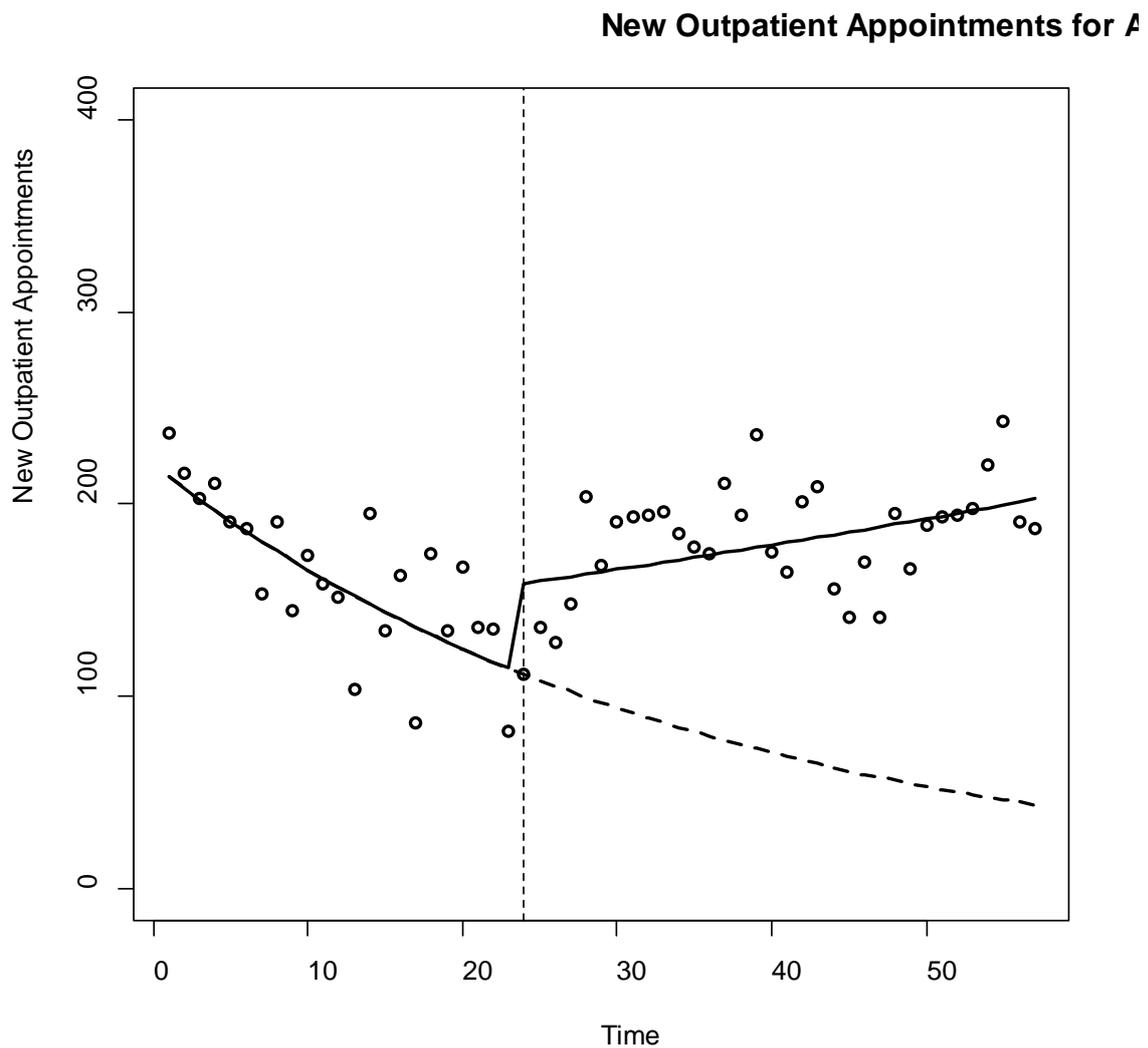


Figure 3

In figure 3, new outpatient appointments for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted counterfactual, this is the predicted new outpatient appointments that would have occurred if the vanguard was had not been introduced.

From April 2013 there was an estimated monthly reduction of 2.8% in new outpatient appointments. When the vanguard was introduced in March 2015, there was an estimated initial step reduction of 31.8%. This was followed by an estimated 3.6 percentage point increase in the monthly increase, resulting in a post-vanguard monthly increase in new outpatient appointments of 0.8%

Had the vanguard not been introduced, the cost of new outpatient appointments would have been £560,311. However due to the introduction of the vanguard, the estimated cost over this time period was higher at £1,388,069. The introduction of the vanguard has resulted in an estimated cost increase due to higher new outpatient appointments of £827,758 over 34 months.

Result 4: Bed days

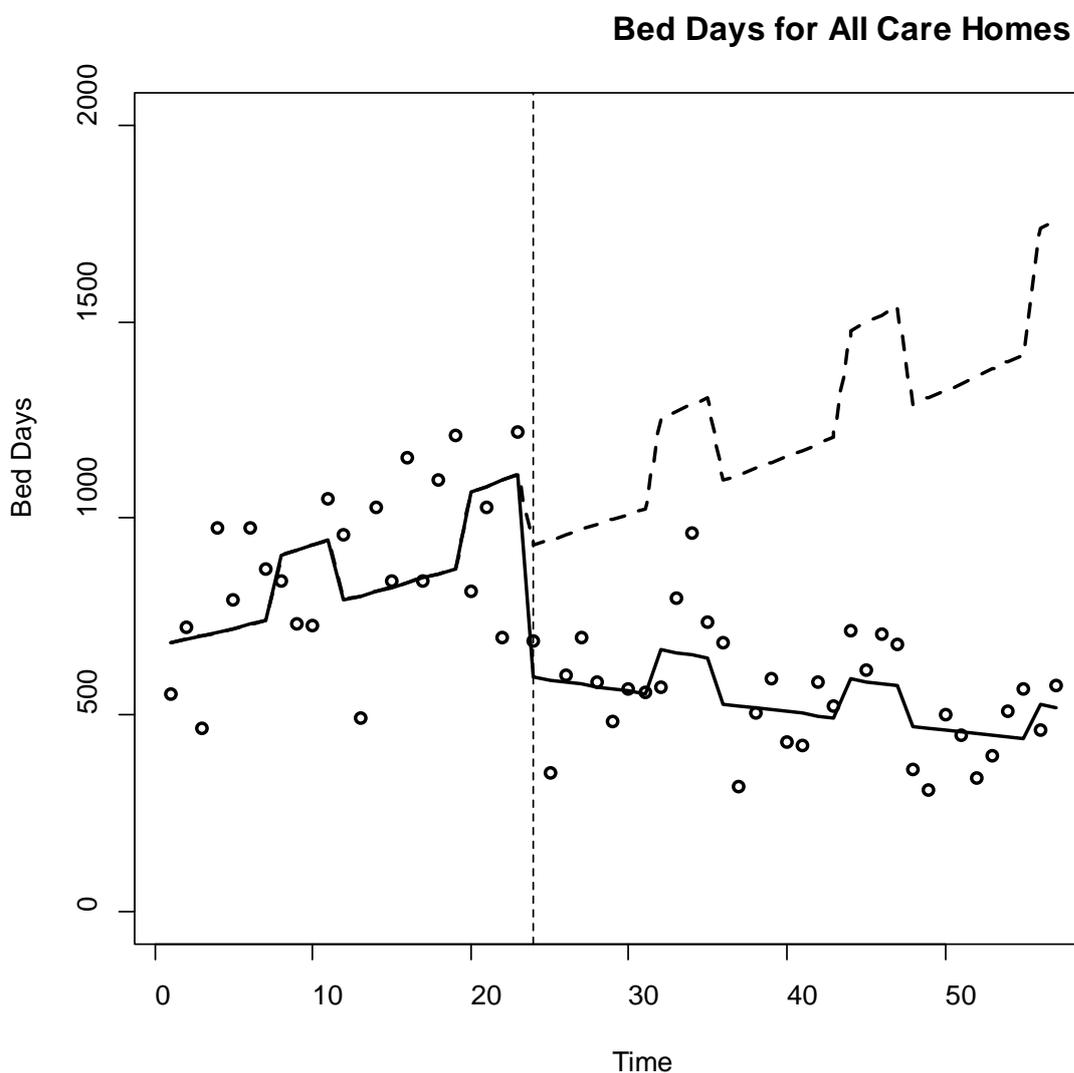


Figure 4

In figure 4, bed days for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted counterfactual, this is the predicted bed days that would have occurred if the vanguard was had not been introduced.

There was an estimated monthly increase in the number of bed-days of 1.4% each month from April 2013 to March 2015. Once the vanguard was introduced, there was an initial estimated step reduction of 42.5%. Following this, there was an estimated 2.3 percentage point change in the monthly trend, resulting in a post-vanguard monthly reduction in the number of bed-days of 0.9%.

Using the cost of a bed day of £400, had the vanguard not been introduced, the cost of Bed Days would have been £16,992,728. However due to the introduction of the vanguard, the estimated cost over this time period was lower at £7,330,264. The introduction of the vanguard has resulted in an estimated cost saving due to lower number Bed Days of £9,662,464 over 34 months.

Using the cost of a bed day of £222, had the vanguard not been introduced, the cost of Bed Days would have been £9,430,964. However due to the introduction of the vanguard, the estimated cost over this time period was lower at £4,068,297. The introduction of the vanguard has resulted in an estimated cost saving due to lower number Bed Days of £5,362,668 over 34 months.

Nursing and mixed Care homes

Using data from seventeen care homes in Gateshead that are either nursing homes or have a mixture of residential and nursing care, the following results were obtained regarding the impact of the vanguard on: A&E attendances, non-elective admissions, new outpatient appointments, and bed days.

Result 5: A&E attendances

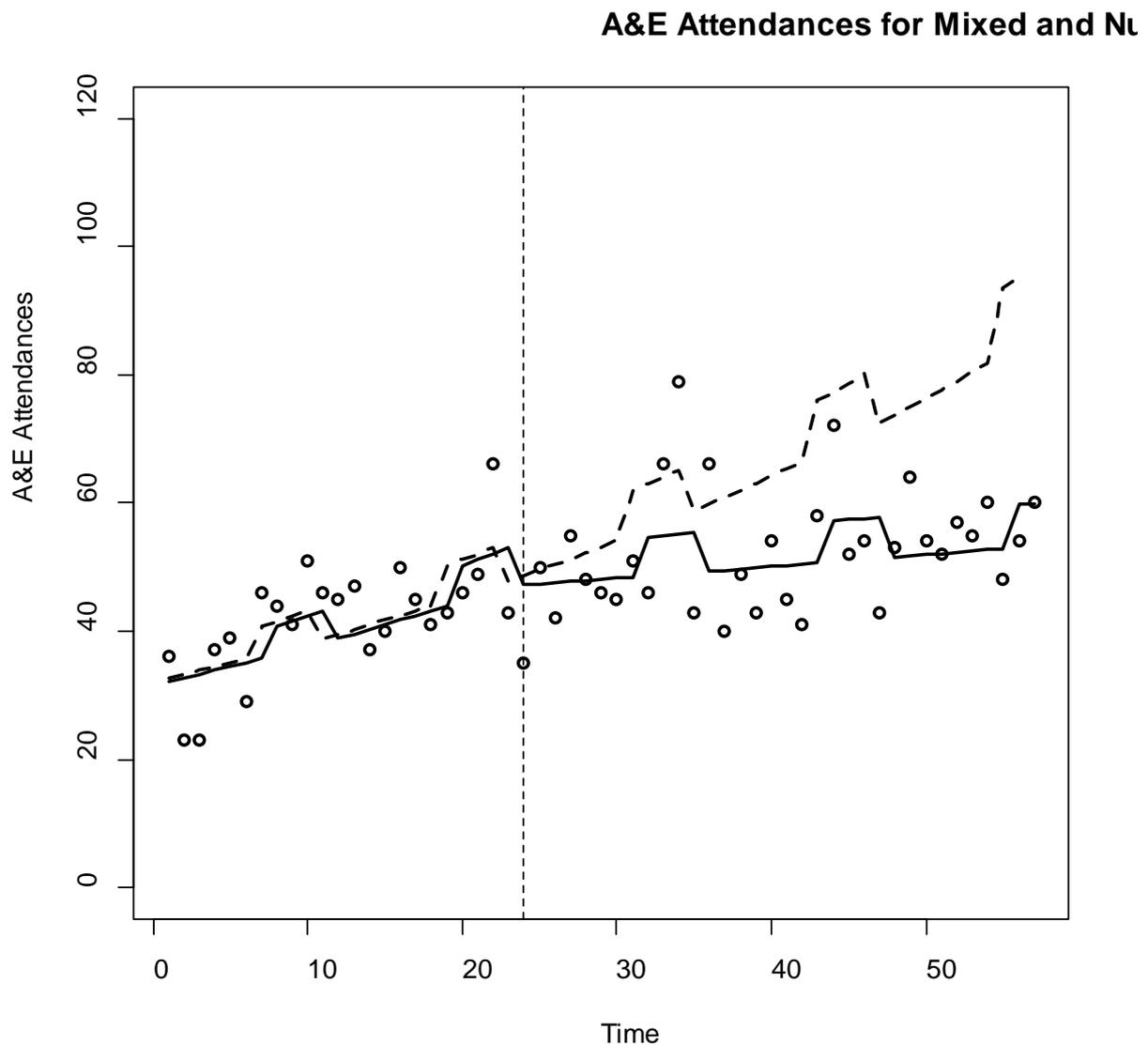


Figure 5

In figure 5, A&E attendances for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted counterfactual, this is the predicted A&E attendances that would have occurred if the vanguard was had not been introduced.

Prior to vanguard there was an estimated monthly increase in A&E admissions of 1.7%. In addition, there was an estimated increase of 11.8% during the winter period. Following the introduction of

the vanguard the monthly increase was estimated at a lower rate of 0.3%. The vanguard has been estimated to have reduced the monthly increase in A&E admissions by 1.4 percentage points.

Had the vanguard not been introduced, the cost of A&E attendances would have been £314,556. However following the introduction of the vanguard, the estimated cost over this time period was lower at £244,243. Over the 34 months since the introduction of the vanguard there has been an estimated cost saving of £70,312 from lower A&E attendances.

Result 6: Non-elective admissions

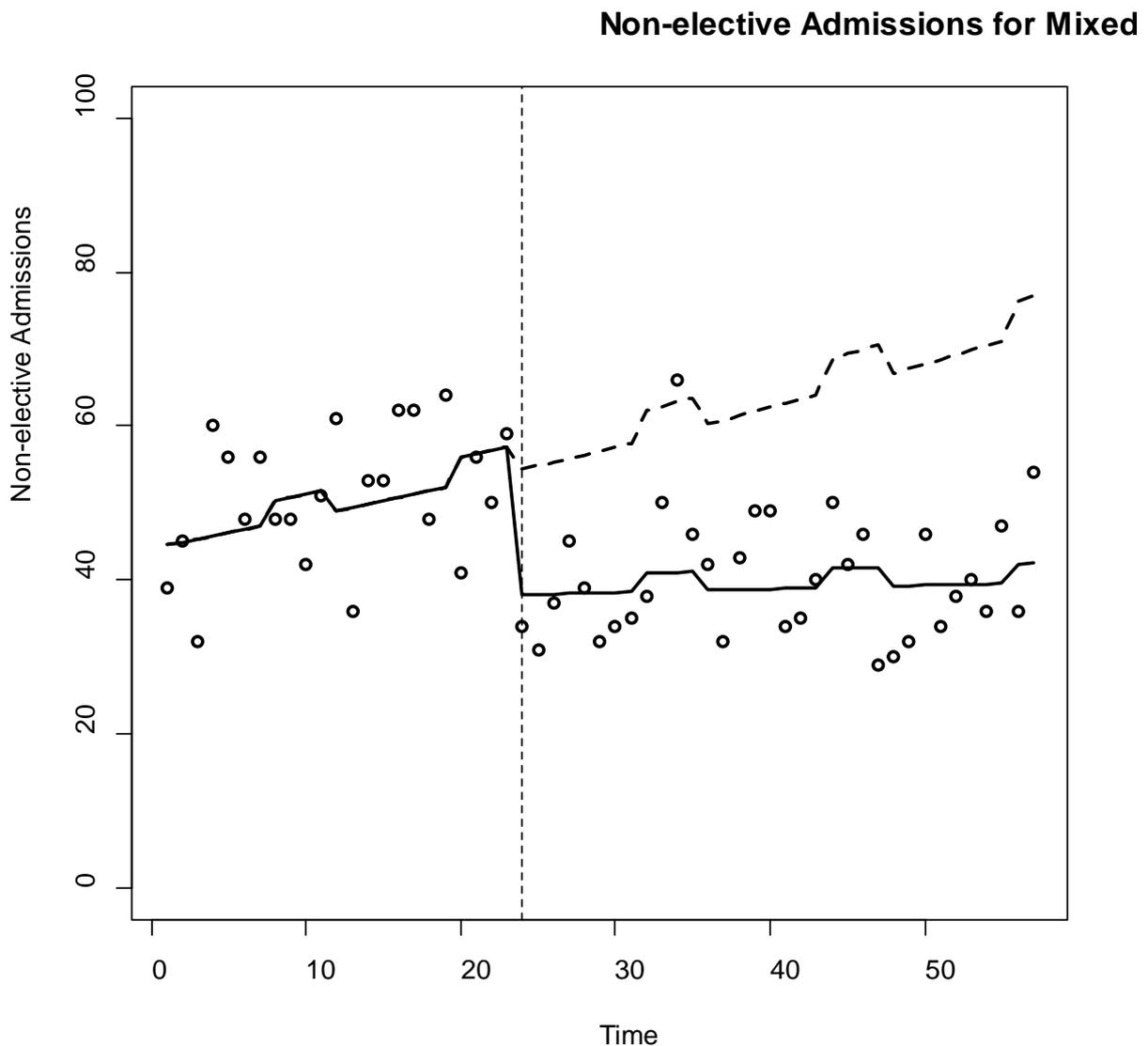


Figure 6

In figure 6, non-elective admissions for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted counterfactual, this is the predicted non-elective admissions that would have occurred if the vanguard was had not been introduced.

There was an estimated monthly increase in non-elective admissions of 0.9% from April 2013 through to March 2015, with an additional 6.2% increase during the winter months. Following the introduction of the vanguard in March 2015, there was an estimated initial step-reduction in non-elective admissions of 34.7%. This was followed by a 0.7 percentage point reduction in the estimated monthly increase, resulting in a post-vanguard monthly increase of 0.2%.

Had the vanguard not been introduced, the cost of non-elective admissions would have been £6,667,388. However due to the introduction of the vanguard, the estimated cost over this time period was lower at £4,118,943. The introduction of the vanguard has resulted in an estimated cost saving due to lower non-elective admissions of £2,548,445 over 34 months.

Result 7: Outpatient appointments (new)

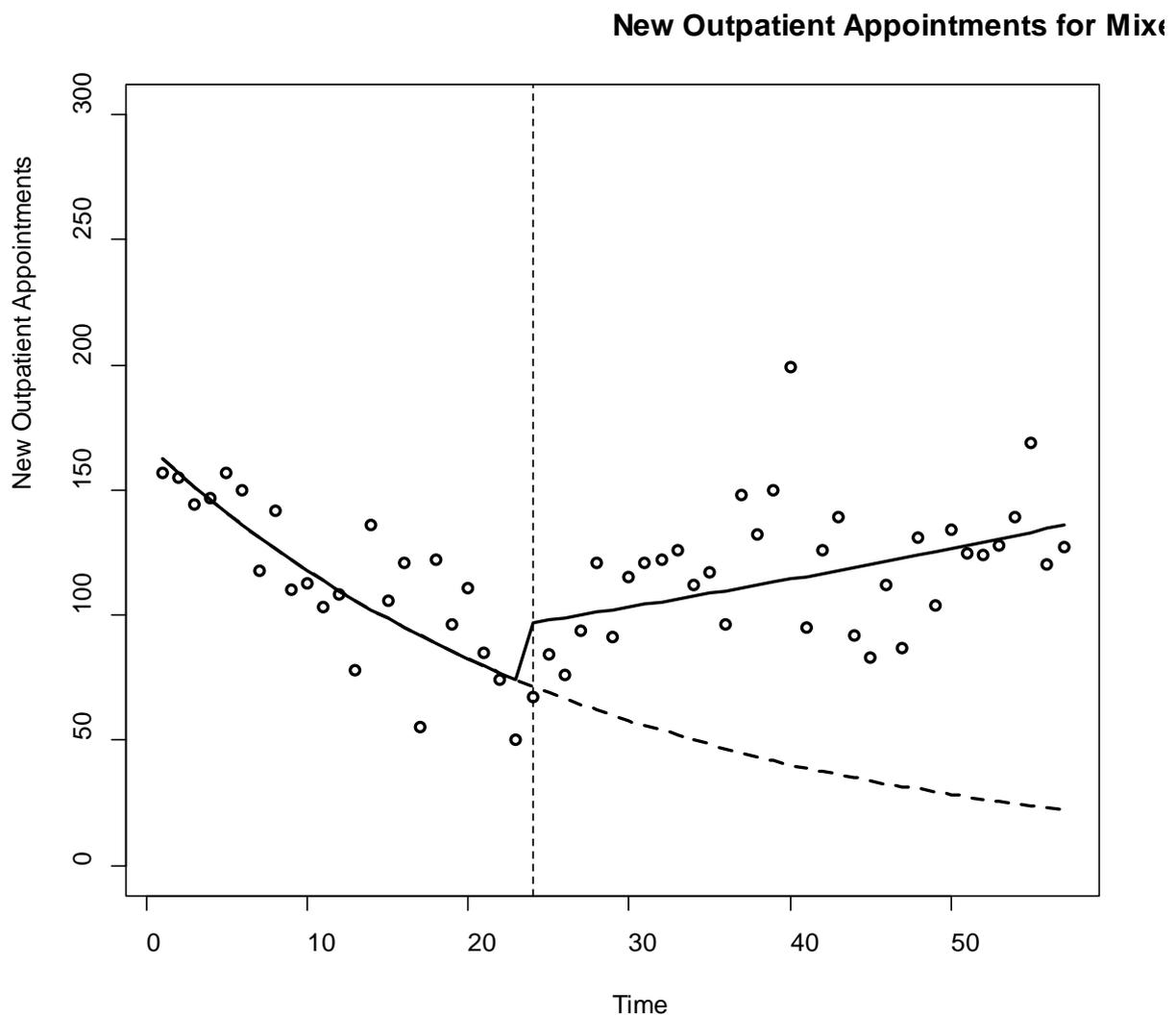


Figure 7

In figure 7, new outpatient appointments for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted

counterfactual, this is the predicted new outpatient appointments that would have occurred if the vanguard was had not been introduced.

There was an estimated monthly reduction in outpatient appointments of 2.1% before the start of the vanguard, with an estimated reduction of 11.7% during the winter months. Following the start of the vanguard, there was an estimated 3.4 percentage point increase in the monthly trend, resulting in a post-vanguard increase of 1.3%.

Had the vanguard not been introduced, the cost of new outpatient appointments would have been £325,500. However due to the introduction of the vanguard, the estimated cost over this time period was higher at £891,005. The introduction of the vanguard has resulted in an estimated cost increase due to higher new outpatient appointments of £565,505 over 34 months.

Result 8: Bed days

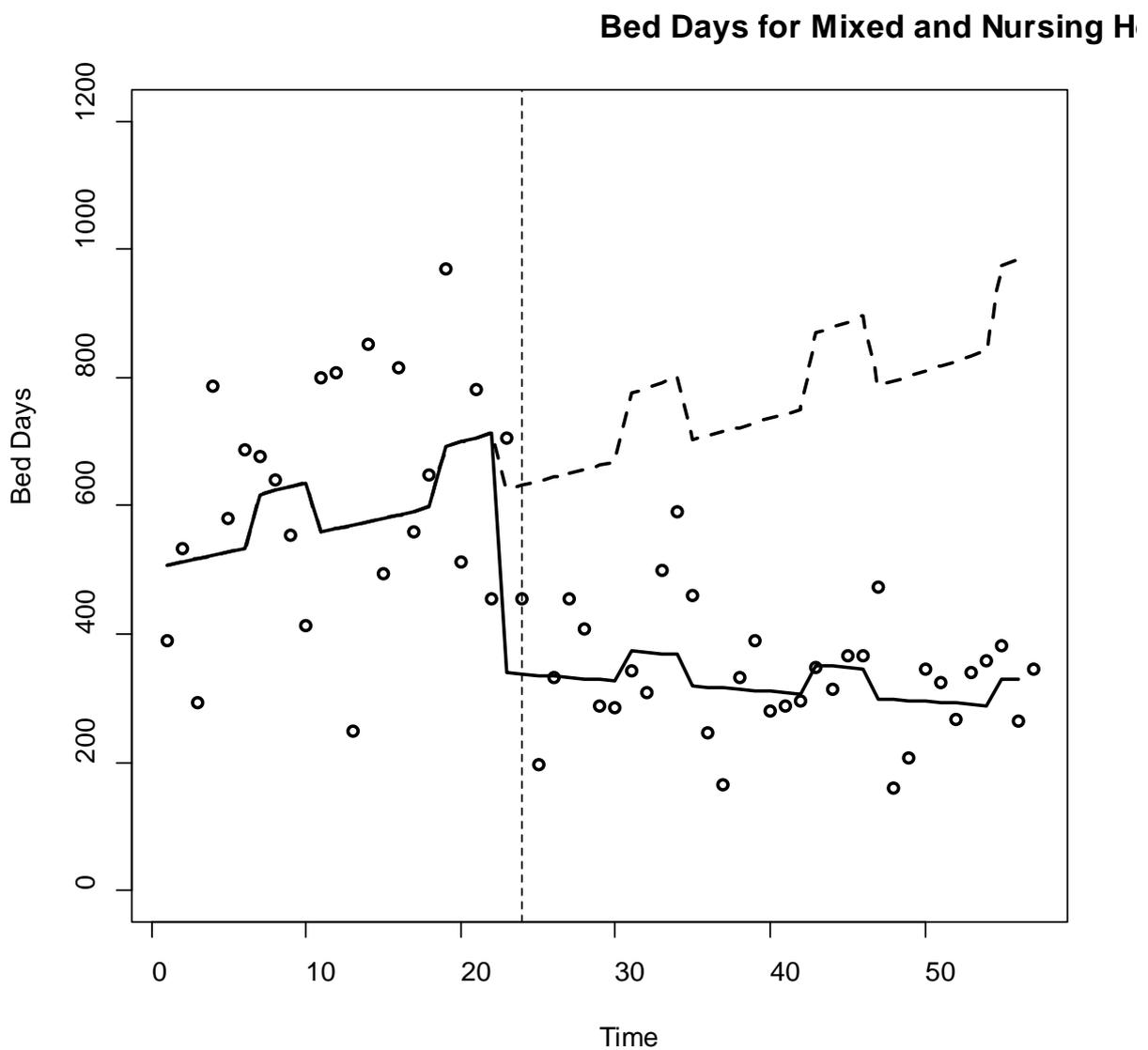


Figure 8:

In figure 8, bed days for each month are shown as the points. The solid line shows the predicted data from the regression model. The dotted line shows the predicted counterfactual, this is the predicted bed days that would have occurred if the vanguard was had not been introduced.

From April 2013 there was an estimated monthly reduction in the number of bed-days of 1.4%. During the winter months there was an estimated increase in the number of bed days of 22.2%. Following the introduction of the vanguard there was a 0.2 percentage point reduction in the monthly trend, resulting in a post-vanguard monthly reduction in bed-days of 1.6%.

Using a cost of a bed-day of £400, had the vanguard not been introduced, the cost of Bed Days would have been £10,453,769. However due to the introduction of the vanguard, the estimated cost over this time period was lower at £4,421,312. The introduction of the vanguard has resulted in an estimated cost saving due to lower number Bed Days of £6,032,484 over 34 months.

Using a cost of a bed-day of £400, had the vanguard not been introduced, the cost of Bed Days would have been £5,801,857. However due to the introduction of the vanguard, the estimated cost over this time period was lower at £2,453,828. The introduction of the vanguard has resulted in an estimated cost saving due to lower number Bed Days of £3,348,029 over 34 months.

SUMMARY

Table 1 shows the resource and associated cost implications during the 34 month post vanguard period for the two populations of care homes. Overall there were cost savings in terms of A&E attendances and non-elective admissions and bed days. It must be noted that the cost implications for non-elective admissions and bed days should be considered as an “either or” option as they are essentially two different methods of calculating cost savings pertaining to inpatient stays. One method is based on a national tariff per admission and one is based on the basis of a bed day cost. Outpatient appointments rose as a consequence of the vanguard and therefore indicates a cost increase.

Table 4: Cost implications of vanguard for resource use

	Cost implications of A&E attendance	Cost implications of Non-elective admissions	Cost implications of Outpatient appointments	Cost implications of Bed days (£400)	Cost implications of bed days (£222)
All Care Homes	Cost saving (£108,035)	Cost saving (£3,161,391)	Cost increase (£827,758)	Cost saving (£9,662,464)	Cost-saving (£5,362,668)
Mixed and Nursing Care Homes	Cost saving (£70,312)	Cost saving (£2,548,445)	Cost increase (£565,505)	Cost saving (£6,032,484)	Cost-saving (£3,348,029)

Total running costs were outweighed by the cumulative cost savings for all outcomes (based on non-elective admissions) over the 34 month period as depicted in table2. Similarly, total running costs were outweighed by cost savings for all outcomes (based on bed days) as shown in Table 3 except the savings were estimated to be much larger when the cost savings is based on a cost per bed day.

Table 5: Overall cost implications of the vanguard (Non-elective admissions)

	Running costs of vanguard	Total cost savings from resource use (Non-elective admissions)	Overall Cost implication (Non-elective admissions)
All Care Homes	£2,237,132	£2,441,668	-£204,536
Mixed and Nursing Care Home	£1,826,336	£2,053,252	-£226,916

Table 6: Overall cost implications of the vanguard (Bed days (£400))

	Running costs of vanguard	Total cost savings from resource use (Bed days)	Overall cost implication (Bed days)
All Care Homes	£2,237,132	£8,942,741	-£6,705,609
Mixed and Nursing Care Home	£1,826,336	£5,537,291	-£3,710,955

Table 7: Overall cost implications of the vanguard (bed days (£222))

	Running costs of vanguard	Total cost savings from resource use (Bed days)	Overall cost implication (Bed days)
All Care Homes	£2,237,132	£4,642,945	-£2,405,813
Mixed and Nursing Care Home	£1,826,336	£2,852,836	-£1,026,500

CONCLUSION

These results indicate that in the period following the introduction of the vanguard there has been an overall downward trend in A&E attendances, non-elective admissions and total monthly bed days. Similarly, outpatient appointments have experienced an overall upward trend possibly due to the earlier and prompt diagnosis of conditions from the MDTs. As a consequence of the changes in these trends substantial cost savings to the NHS have been estimated. The largest predicted cost-savings are as a consequence in reduced non-elected admissions. The highest use of acute-beds due to emergency admissions are typical of trends found elsewhere (Wittenberg et al 2014). It must be noted that the cost-savings identified due to non-elective admissions are sensitive to the calculations of the unit cost utilized. For example, cost savings are greatest when a unit cost of a bed day of £400 is utilized. Using an enhanced tariff option of £222 per bed-day, these cost savings are reduced. Furthermore, if a single tariff option is used per non-elective admission, taking no account for length of stay, the cost savings are reduced further.

The limitations of this study are firstly the reliability of the data in terms of identifying NHS resource use by care home resident by use of a postcode proxy. The effect of this was minimised by using resource use for the 80 years and over age group. Furthermore, despite GP costs being included in the running costs of the vanguard, the use of wider primary care resources has not been included in this evaluation.

Despite these limitations, as highlighted by The Kings Fund (2013), this study has provided a clear attribution of the impact of the integration of health on social care in the form of the Enhanced Health in Care Homes Vanguard. The results of this evaluation are based on robust statistical method and contribute to the growing evidence base on New Models of Care and an Enhanced Health in Care Homes vanguard. As highlighted by Wagner et al (2002) Interrupted time series design is the strongest, quasi-experimental approach for evaluating longitudinal effects of interventions. Rather than short-term evaluations that are often utilised to measure the impact of service transformations within the Health and Social care system, this study shows the mid to long-term impact of the introduction of an integrated health and social care model.

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